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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/800,638	03/07/2001	C. Brian Atkins	10004248-1	3332

7590 02/13/2004

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EXAMINER	
ROSARIO-VASQUEZ, DENNIS	

ART UNIT	PAPER NUMBER
2621	6

DATE MAILED: 02/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No.	Applicant(s)
	09/800,638	ATKINS ET AL.
	Examiner	Art Unit
	Dennis Rosario-Vasquez	2621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _THREE_ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _07 March 2001_.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-20_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-20_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _07 March 2001_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _5_.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities:

Page 13, line 26: "420" should be changed to "430" for a proper correspondence with figure 4.

Page 20, line 26: "horizontal" should be changed to "vertical".

Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-17,19-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Itoh (U.S. Patent 5,818,964 A).

Regarding claim 1, which is representative of claim 8, Itoh discloses an image processing system comprising:

a) a filter selection mechanism (fig. 1, num. 4,5, and 6) for receiving an input pixel window ("INPUT IMAGE" of figure 1 is an "8X8-block from the image data (Itoh @ col. 3, lines 38,39)." and responsive thereto for generating a filter identifier (Itoh states,"...the optimum filter for noise filtering is selected by taking binary index...as a reference (col.3 , lines 66,67).") based on an edge parameter (Itoh: "features of edges, texture, etc. "@ col. 4, line 35 and "distance from edges...@ col. 4, line 63 and"...the region containing edges by two or three representative pixel values." @ col.3 lines 26,27) computed based on the input pixel window and an activity metric ("mean value and the median (central value) of the dynamic range (col. 3, lines 63,64).") computed based on the input pixel window; and

b) a filter application unit (fig. 1, num. 7: ADAPTIVE FILTERING UNIT) coupled to the filter selection mechanism for receiving the filter identifier and applying a filter identified by the filter identifier to the input pixel window to generate an output pixel (Itoh states," By means of adaptive filter processing unit 7, the adaptive filter processing operation can be performed relatively easily, and it is possible to obtain output level θ... Selection of the filter is executed for each window (col. 4, lines 10-18).").

Regarding claim 2, Itoh discloses the image processing system of claim 1 further comprising:

an edge parameter evaluation unit (fig. 1, num. 5: BINARY INDEX UINT) for computing at least one edge parameter based on the input pixel window.

Regarding claims 12 and 19, which is representative of claim 3, Itoh discloses the image processing system of claims 2,8, and 15 wherein the step of computing at least one edge parameter is based in the input pixel window includes the step of:

computing an edge angle and any measurable unit related to an edge (Itoh states,"...the concept of index generation is derived from...coding that can represent the region containing edges by two or three representative pixel values. Index generation must be performed in units of rectangular blocks...(col. 3, lines 25-29).").

Regarding claim 4, Itoh discloses the image processing system of claim 1 further comprising:

an activity metric evaluation unit (fig. 1, numeral 4) for computing at least one activity metric ("mean value and the median (central value) of the dynamic range (col. 3, lines 63,64).") based on the input pixel window.

Regarding claims 5 and 14, Itoh discloses the image processing system of claims 4 and 13 wherein the activity metric is a level of variation of a luminance plane ("gray level in the block" @ Itoh: col. 3, line 59).

Regarding claim 6, Itoh discloses the image processing system of claim 1 wherein the filter application unit includes a filter repository (Itoh uses equation 2 that contains filter coefficients at column 4 for the adaptive processing unit 7 of figure 1 (col 4, lines 6-17) plurality of filters ("Classification is made into three types [of filtering] (col. 4, lines19-22).") for use by the filter application unit.

Regarding claim 7, Itoh discloses the image processing system of claim 6 wherein the filter repository includes a smoothing filter ("strong smoothing filter" @ col. 4, line 41).

With regard to claim 9, which is representative of claims 10 and 16, Itoh discloses the method of claims 8 and 15 wherein the step of receiving an input pixel window corresponding to the current input pixel includes the step of:

receiving an input pixel window that includes a current input pixel and pixels adjacent to the current input pixel (Itoh states," As can be seen in this fig., 3X 3 [filter] window is defined appropriately to ensure that the pixel being filtered in the 8X8 block [portion of the input image] is located at the center of the window (col. 4, lines 25-27).").

Regarding claim 11, claim 1 is representative of claim 11 except for requiring the additional element of utilizing the edge parameter to generate the filter identifier. Itoh discloses the additional element and states," Classification is made into three types, that is, homogeneous, heterogeneous, and impulse noise, corresponding to the value of each binary index φ present in the window (col. 4, lines 19-22).").

Regarding claim 13, Itoh discloses the method of claim 8 wherein the step of generating a filter identifier based on one of an edge parameter and an activity metric (grey level) includes the step of computing an activity metric based on the input pixel window; and using the activity metric to generate the filter identifier (Itoh states," Suppose the gray level is p for the pixel tested by using threshold E, the binary index φ can be defined...(col. 3, lines 50,51).")

Regarding claim 15,which is representative of claim 20, Itoh discloses a method for processing a digital image having a plurality of input pixels comprising (Itoh states,"...image data with a size of 704X408 pixels is input...(col.3, lines 31,32).":

receiving the digital image (fig. 1, labeled "INPUT IMAGE");

for each input pixel generating a level of activity ("dynamic range" @ col. 3, lines 40,41 and 61-64) based on a first window of pixels ("8X8...blocks" @ col. 3, lines 31-33) with reference to the input pixel;

determining whether the level of variation is in a predetermined relationship with a predetermined level of variation (Itoh states," In binary index unit 5, the threshold obtained for each block is compared with each pixel value in the corresponding block, and the binary indexes corresponding to each pixel, that is, the binary data representing the higher gray level and the lower gray level, are generated (col. 3, lines 45-49)."[Therefore each gray scale pixel value is binarized.]);

when the level of variation is in a predetermined relationship with a predetermined level of variation (region of indexes of a 3X3 window), applying a first filter (Itoh states, For the homogeneous region made up of the same indexes, filter processing is performed using a relatively strong smoothing filter to suppress noises. As shown in FIG. 3A, the filter has the coefficients of a size corresponding to the window, and, for the value of the various coefficients, a value of "1/9," which is obtained by dividing by the number of 3 x 3 pixels, is selected (col. 4, lines 38-44)." [Therefore the region made up of the same indexes determines the type of filtering])"; and

when the level of variation is not in a predetermined relationship with a predetermined level of variation (Itoh states," Then, for the heterogeneous region made up of two indexes, since edges, texture, and other features exist, the filter processing is performed using a relatively weak smoothing filter, and the features are preserved. As shown in FIG. 3B, for the filter, only pixels with the

same index as that of the central pixel are counted, and a value of "1/6," which is obtained by dividing by the number, is selected. On the other hand, the coefficient is set as "0" for pixels with an index different from that of the central pixel (col. 4, lines 45-53)."), generating a measure of an edge parameter (Itoh states," In this way, the weighing coefficient of the filter is selected corresponding to the region characteristics of the window (distance from edges and texture, presence/absence of these features (col. 4, lines 61-64)).") based on a second window of pixels (fig. 1, labeled "INPUT IMAGE" and figure 2) with reference to the input pixel, selecting an enhancement filter based on the measure of edge angle (Figure 3B shows an edge filter that corresponds to the edge orientation of figure 2), and applying the selected enhancement filter to a third window (fig. 1, labeled "INPUT IMAGE" and figure 2) to generate an output pixel (figure 1, labeled "OUTPUT") corresponding to the current input pixel.

Regarding claim 17, Itoh discloses the method of claim 15 wherein the first filter is a low pass filter that replaces the current input pixel with a blurred version ("strong smoothing filter to suppress noises" @ col. 4, line 40) of the current input pixel.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh (U.S. Patent 5,818,964 A) and in view of Kim (U.S. Patent 6,078,686 A).

Claim 18 is similar to claim 15 except for the additional element of using the mean absolute deviation (MAD) for each respective step of claim 18.

Itoh teaches all the elements of claims 18 as shown above for claim 15 except for the use of MAD. Instead Itoh uses a gray scale or luminance as a threshold.

However, Kim does teach the additional elements of claim 18 of the method of claim 15: wherein the step of generating a level of activity based on a first window of pixels with reference to the input pixel include determining a mean absolute deviation (MAD) for color planes (Kim states, "The color compensator 500 maps a current color signal put on a given luminance plane to a color signal obtained by moving in a color direction until the color signal intersects an enhanced luminance plane in an RGB space (col. 5, lines 10-13).") based on a first window of pixels (Using figure 2,Kim states," A first mean and deviation calculator 204 receives samples of the large window (W.sub.L) generated by the window generator 202, obtains a mean sample value (A.sub.L) of the large window (W.sub.L) using the following equation 8, and calculates the mean (D.sub.L) of the absolute deviations of the samples of the large window (W.sub.L) using the following equation 9 (col. 7, lines 3-8). "; wherein the first window includes the input pixel;

wherein the step of determining whether the level of variation is in a predetermined relationship with a predetermined level of variation includes comparing the MAD (Δk) with a predetermined threshold (γ.g(X.sub.k))(Kim states," A limiter 332 compares the variation amount (Δk) output by the subtracter 324 with the limit value (γ.g(X.sub.k)) output by the multiplier 330, restricts the variation amount (Δk) and outputs a restricted variation amount (Δk') like the following equation 25 (col. 12, lines 26-30).");

wherein the step of when the level of variation is in a predetermined relationship with a predetermined level of variation, applying a first filter ("low-pass filter (LPF) 404 [of figure 7]" @ col. 12, line 57) includes when the MAD (Δk) is less than the predetermined threshold (Kim states," When the variation amount (Δk) is smaller than -(γ.g(X.sub.k)), the variation amount (Δk) is restricted to the -(γ.g(X.sub.k))... (col. 12, lines 41-43).", applying a low pass filter to the input pixel to generate

an output pixel (The thresholding of (Δk) or MAD is performed within figure 1, num. 300 and figure 2. Respectively, the output results of figures 1 and 2, num. 300 and 216 are outputted to figure 1, num. 400, which contains the low-pass filter as shown in figure 7, num. 404.);

wherein the step of when the level of variation is not in a predetermined relationship with a predetermined level of variation, generating a measure of edge angle based on a second window of pixels with reference to the input pixel, selecting an enhancement filter based on the measure of edge angle, and applying the selected enhancement filter to a third window to generate an output pixel corresponding to the current input pixel includes when the MAD is not less than the predetermined threshold (Kim states," When the variation amount (Δk) is greater than (γ.g(X.sub.k)), the variation amount (Δk) is restricted to the (γ.g(X.sub.k)), (col. 12, lines 39-41)."), selectively applying to a third window of pixels one set of filter coefficients selected from a group of sets of enhancement filter coefficients (Kim states,"wherein b.sub.ij is a predetermined coefficient, and corresponds to an impulse response of the M.times.N LPF 404 (col. 13, lines 16,17).") based on at least one edge parameter computed from the second window of pixels to generate an output pixel.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Itoh's gray scale values or luminance for filter selection with Kim's MAD because a comparison of MAD values provides gain control which prevents excessive enhancement (Kim @ col. 11, lines 66,67 and col. 12, lines 43,44).

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Ghaderi (U.S. Patent 5,481,628 A) is pertinent as teaching a method of using mean absolute variation with an adaptive filter (col. 3, lines 1-15).

Fujisawa (U.S. Patent 5,245,445 A) is pertinent as teaching a method of using an edge (fig. 10, num. 30,31) and smoothing filters (fig. 10, num. 26,27) with a selector (fig. 10, num. 35).

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dennis Rosario-Vasquez whose telephone number is 703-305-5431. The examiner can normally be reached on 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Boudreau can be reached on 703-305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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